

## PETER HAEBERLI

### BAR ADMISSIONS

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Supreme Court of the State of Colorado  
*Registration Number 037392*

Supreme Court of the State of California  
*Registration Number 800900*

United States Patent and Trademark Office  
*Registration Number 52,980*

### PROFESSIONAL EXPERIENCE

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March 2007-present Merck & Co., Inc.  
*Managing Assistant Counsel*

- Patent Counsel responsible for Merck RNA Therapeutics Program

January 2005-March 2007 Sirna Therapeutics Inc.  
*Director, Intellectual Property*

- Patent Counsel responsible for Sirna intellectual property portfolio

January 2003-January 2005 Sirna Therapeutics Inc.  
*Associate Director, Intellectual Property*

- Developed RNAi based intellectual property platform

January 2001-January 2003 Ribozyme Pharmaceuticals Inc.  
*Manager, Intellectual Property*

- Prepared seminal patents on chemically modified short interfering nucleic acid (siNA) technology

August 1999-January 2001 Ribozyme Pharmaceuticals Inc.  
*Intellectual Property Liaison*

- Acted as liaison between scientific and legal staff for patent preparation and prosecution matters

June 1993-August 1999 Ribozyme Pharmaceuticals Inc.  
*Research Associate, Organic Chemistry*

- Responsible for research and development of chemically modified oligonucleotide therapeutic modalities and delivery systems
- Developed novel synthetic strategies for key nucleic acid based pharmaceutical intermediates
- Designed and synthesized modified nucleic acids for preclinical and clinical programs
- Active in GMP, process development, and basic research applications of nucleic acid chemistry

September 1992-June 1993

Geneva Pharmaceuticals Inc.

*Chemist*

- Performed analytical research and development activities

Summers 1989-1991

Ciba-Geigy Inc.

*Summer Specialist*

- Assisted in chemical synthesis and process development activities to support IND filings

## EDUCATION

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University of Denver Strum College of Law

*J.D., Order of St. Ives, 2005*

- GPA 3.7
- Recipient of 7 scholastic excellence awards

University of Colorado, Boulder

*B.S., Molecular, Cellular, Developmental Biology, 1992*

- GPA 3.5

1. Haerberli, Peter; Berger, Imre; Pallan, Pradeep S.; Egli, Martin. *Syntheses of 4'-thioribonucleosides and thermodynamic stability and crystal structure of RNA oligomers with incorporated 4'-thiocytosine*. Nucleic Acids Research (2005), 33(13), 3965-3975.
2. Karpeisky, Alexander; Sweedler, David; Haerberli, Peter; Read, Javier; Jarvis, Keith; Beigelman, Leonid. *Scaleable and efficient synthesis of 2'-deoxy-2'-N-phthaloyl nucleoside phosphoramidites for oligonucleotide synthesis*. Bioorganic & Medicinal Chemistry Letters (2002), 12(22), 3345-3347.
3. Radka, Susan F.; Pasko, Christopher; Haerberli, Peter; Beigelman, Leo. *The development of a monoclonal antibody specific for a 2'-C-allyl modification of uridine, and its use in the localization of ribozymes in vivo*. Analytical Biochemistry (2002), 307(1), 40-46.
4. Matulic-Adamic, Jasenka; Serebryany, Vladimir; Haerberli, Peter; Mokler, Victor R.; Beigelman, Leonid. *Synthesis of N-Acetyl-D-galactosamine and Folic Acid Conjugated Ribozymes*. Bioconjugate Chemistry (2002), 13(5), 1071-1078.
5. Matulic-Adamic, Jasenka; Daniher, Andrew T.; Karpeisky, Alexander; Haerberli, Peter; Sweedler, David; Beigelman, Leonid. *Synthesis of modified nucleoside 5'-triphosphates for in vitro selection of catalytic nucleic acids*. Nucleosides, Nucleotides & Nucleic Acids (2001), 20(4-7), 1113-1115.
6. Minasov, George; Matulic-Adamic, Jasenka; Wilds, Christopher J.; Haerberli, Peter; Usman, Nassim; Beigelman, Leonid; Egli, Martin. *Crystal structure of an RNA duplex containing phenyl-ribonucleotides, hydrophobic isosteres of the natural pyrimidines*. RNA (2000), 6(11), 1516-1528.
7. Beigelman, Leonid; Matulic-Adamic, Jasenka; Karpeisky, Alexander; Haerberli, Peter; Sweedler, David. *Base-modified phosphoramidite analogs of pyrimidine ribonucleosides for RNA structure-activity studies*. Methods in Enzymology (2000), 317(RNA-Ligand Interactions, Pt. A), 39-65.
8. Matulic-Adamic, Jasenka; Daniher, Andrew T.; Karpeisky, Alexander; Haerberli, Peter; Sweedler, David; Beigelman, Leonid. *Functionalized nucleoside 5'-triphosphates for in vitro selection of new catalytic ribonucleic acids*. Bioorganic & Medicinal Chemistry Letters (2000), 10(11), 1299-1302.
9. Beigelman, Leonid; Haerberli, Peter; Sweedler, David; Karpeisky, Alexander. *Improved synthetic approaches toward 2'-O-methyl-adenosine and guanosine and their N-acyl derivatives*. Tetrahedron (2000), 56(8), 1047-1056.
10. Gaur, Rajesh K.; Beigelman, Leonid; Haerberli, Peter; Maniatis, Tom. *Role of adenine functional groups in the recognition of the 3'-splice-site AG during the second step of pre-mRNA splicing*. Proceedings of the National Academy of Sciences of the United States of America (2000), 97(1), 115-120.
11. Matulic-Adamic, Jasenka; Haerberli, Peter; Drenzo, Anthony B.; Mokler, Victor R.; Maloney, Lara; Beigelman, Leonid; Usman, Nassim; Wincott, Francine E. *Synthesis and incorporation of 5'-amino- and 5'-mercapto-5'-deoxy-2'-O-methyl nucleosides into hammerhead ribozymes*. Nucleosides & Nucleotides (1997), 16(10 & 11), 1933-1950.
12. Liu, Qiaolin; Green, Justin B.; Khodadadi, Arbi; Haerberli, Peter; Beigelman, Leonid; Pyle, Anna Marie. *Branch-site selection in a group II intron mediated by active recognition of the adenine amino group and steric exclusion of non-adenine functionalities*. Journal of

13. DiRenzo, Anthony; Grimm, Susan; Levy, Kurt; Haerberli, Peter; Maloney, Lara; Usman, Nassim; Wincott, Francine. *2'-Substituted phosphorothioate containing oligoribonucleotides: an application to the synthesis and purification of hammerhead ribozymes.* Nucleosides & Nucleotides (1996), 15(11 & 12), 1687-1700.
14. Beigelman, Leonid; Karpeisky, Alexander; Matulic-Adamic, Jasenka; Haerberli, Peter; Sweedler, David; Usman, Nassim. Dep. Chem. Biochem., *Synthesis of 2'-modified nucleotides and their incorporation into hammerhead ribozymes.* Nucleic Acids Research (1995), 23(21), 4434-42.
15. Beigelman, Leo; Matulic-Adamic, Jasenka; Haerberli, Peter; Usman, Nassim; Dong, Beihua; Silverman, Robert H.; Khamnei, Shahrzad; Torrence, Paul F. *Synthesis and biological activities of a phosphorodithioate analog of 2',5'-oligoadenylate.* Nucleic Acids Research (1995), 23(19), 3989-94.
16. Matulic-Adamic, Jasenka; Haerberli, Peter; Usman, Nassim. *Synthesis of 5'-Deoxy-5'-Difluoromethyl Phosphonate Nucleotide Analogs.* Journal of Organic Chemistry (1995), 60(8), 2563-9.

## PATENTS AND PATENT APPLICATIONS

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1. McSwiggen, James; Beigelman, Leonid; Usman, Nassim; Haerberli, Peter; Chowrira, Bharat; Polisky, Barry. *RNA interference-mediated inhibition of mitogen-activated protein kinase gene expression or expression of genes involved in MAP kinase pathway using short interfering nucleic acids.* U.S. Pat. Appl. Publ. (2006), US 2006127891.
2. Haerberli, Peter; Beigelman, Leonid. *Modified short interfering nucleic acids with reduced immunostimulatory activity for RNA interference-mediated inhibition of gene expression.* U.S. Pat. Appl. Publ. (2005), US 2005282188.
3. McSwiggen, James; Chowrira, Bharat M.; Haerberli, Peter; Beigelman, Leonid; Usman, Nassim. *RNA interference-mediated inhibition of MAP kinase p38 gene expression using short interfering nucleic acid (siNA).* U.S. Pat. Appl. Publ. (2005), US 2005239731.
4. Vargeese, Chandra; Wang, Weimin; Chen, Tongqian; Sweedler, David; Haerberli, Peter. (Sirna Therapeutics, Inc., USA). *Polycationic compositions for cellular delivery of polynucleotides.* U.S. Pat. Appl. Publ. (2005), US 20050222064.
5. Morrissey, David; Haerberli, Peter. (Sirna Therapeutics, Inc., USA). *Nucleic acid mediated inhibition of cytolytic toxin activity and uses thereof for diagnosis and for inhibiting enterococcus infection.* U.S. Pat. Appl. Publ. (2005), US 20050209182.
6. McSwiggen, James; Chowrira, Bharat M.; Haerberli, Peter. (Sirna Therapeutics, Inc., USA). *RNA interference-mediated inhibition of NOGO receptor gene expression using short interfering nucleic acid (siNA).* U.S. Pat. Appl. Publ. (2005), US 2005182008.
7. McSwiggen, James; Beigelman, Leonid; Haerberli, Peter; Usman, Nassim. (Sirna Therapeutics, Inc., USA). *RNA interference-mediated inhibition of Polycomb group protein EZH2 gene expression using short interfering nucleic acids.* U.S. Pat. Appl. Publ. (2005), US 2005159382.
8. McSwiggen, James; Haerberli, Peter; Beigelman, Leonid. (Sirna Therapeutics, Inc., USA). *RNA interference-mediated treatment of Parkinson disease using short interfering nucleic acids.* U.S. Pat. Appl. Publ. (2005), US 2005137155.
9. McSwiggen, James; Beigelman, Leonid; Haerberli, Peter. (Sirna Therapeutics, Inc., USA). *RNA interference-mediated inhibition of G72 and D-amino acid oxidase gene expression using short interfering nucleic acids.* U.S. Pat. Appl. Publ. (2005), US 2005136436.
10. Haerberli, Peter; McSwiggen, James. (Sirna Therapeutics, Inc., USA). *RNA interference-mediated inhibition of Fas and FasL gene expression using short interfering nucleic acid.* U.S. Pat. Appl. Publ. (2005), US 2005119212.
11. McSwiggen, James; Chowrira, Bharat; Beigelman, Leonid; Macejak, Dennis; Zinnen, Shawn; Pavco, Pamela; Haerberli, Peter; Morrissey, David; Fosnaugh, Kathy; Jamison, Sharon; Usman, Nassim; Thompson, James; Vargeese, Chandra; Wang, Weimin; Chen, Tongqian; Vaish, Narendra. (Sirna Therapeutics, Inc., USA). *RNA interference-mediated inhibition of gene expression using chemically modified short interfering nucleic acids.* U.S. Pat. Appl. Publ. (2005), US 2005020525.
12. Vargeese, Chandra; Wang, Weimin; Chen, Tongqian; Sweedler, David; Haerberli, Peter. (Sirna Therapeutics, Inc., USA). *Polycationic compositions for cellular delivery of polynucleotides.* PCT Int. Appl. (2005), WO 2005007854.
13. Vargeese, Chandra; Haerberli, Peter; Wang, Weimin; Chen, Tongqian. (Sirna Therapeutics, Inc.,

- USA). *Branched compounds containing bioactive molecules and targeting moieties for cellular delivery.* U.S. Pat. Appl. Publ. (2004), US 2004249178.
14. McSwiggen, James; Beigelman, Leonid; Usman, Nassim; Haerberli, Peter; Chowrira, Bharat; Polisky, Barry. (Sirna Therapeutics, Inc., USA). *RNA interference mediated inhibition of MAP kinase gene expression using short interfering nucleic acid (siNA).* PCT Int. Appl. (2004), WO 2004097020.
15. McSwiggen, James; Haerberli, Peter; Chowrira, Bharat. (Sirna Therapeutics, Inc., USA). *RNA interference mediated treatment of Parkinson disease using short interfering nucleic acid (siNA).* U.S. Pat. Appl. Publ. (2004), US 2004219671.
16. McSwiggen, James; Bharat, Chowrira; Haerberli, Peter. (Sirna Therapeutics, Inc., USA). *RNA interference-mediated inhibition of severe acute respiratory syndrome virus gene expression using siRNA.* PCT Int. Appl. (2004), WO 2004092383.
17. McSwiggen, James; Chowrira, Bharat; Beigelman, Leonid; Macejak, Dennis; Zinnen, Shawn; Pavco, Pamela; Haerberli, Peter; Morrissey, David; Fosnaugh, Kathy; Jamison, Sharon; Usman, Nassim; Thompson, James; Vargeese, Chandra; Wang, Weimin; Chen, Tongqian; Vaish, Narendra. (USA). *RNA interference-mediated inhibition of gene expression using chemically modified short interfering nucleic acids.* U.S. Pat. Appl. Publ. (2004), US 2004192626.
18. Vargeese, Chandra; Haerberli, Peter; Wang, Weimin; Chen, Tongqian. (Ribozyme Pharmaceuticals, Inc., USA). *Branched compounds containing bioactive molecules and targeting moieties for cellular delivery.* U.S. Pat. Appl. Publ. (2004), US 2004110296.
19. Morrissey, David; Haerberli, Peter. (Sirna Therapeutics, Inc., USA). *Nucleic acid mediated inhibition of enterococcus infection and cytotoxin activity.* PCT Int. Appl. (2003), WO 2003106476.
20. Seiwert, Scott; Zinnen, Shawn; Usman, Nassim; McSwiggen, James; Vaish, Narendra; Haerberli, Peter; Chowrira, Bharat; Blatt, Lawrence; Jadhav, Vasant; Kossen, Karl. (Ribozyme Pharmaceuticals, Incorporated, USA; Sirna Therapeutics Inc.). *Allosteric nucleic acid sensor molecules designed for detection of nucleic acid and protein targets.* PCT Int. Appl. (2003), WO 2003089650.
21. Blatt, Lawrence; McSwiggen, James; Chowrira, Bharat M.; Haerberli, Peter. (Ribozyme Pharmaceuticals, Inc., USA). *Nucleic acid-based modulation of NOD1 and NOD2 receptor interactions and genes for treatment and/or diagnosis of associated diseases.* U.S. Pat. Appl. Publ. (2003), US 2003203870.
22. McSwiggen, James; Beigelman, Leonid; Usman, Nassim; Haerberli, Peter; Chowrira, Bharat. (Sirna Therapeutics, Inc., USA). *RNA interference-mediated inhibition of MAP kinase gene expression using short interfering nucleic acids.* PCT Int. Appl. (2003), WO 2003072590.
23. McSwiggen, James; Beigelman, Leonid; Haerberli, Peter; Usman, Nassim. (Ribozyme Pharmaceuticals, Incorporated, USA; Sirna Therapeutics Inc.). *RNA interference-mediated inhibition of polycomb group protein EZH2 gene expression using short interfering nucleic acids.* PCT Int. Appl. (2003), WO 2003070887.
24. McSwiggen, James; Beigelman, Leonid; Haerberli, Peter. (Ribozyme Pharmaceuticals, Inc., USA). *RNA interference-mediated inhibition of G72 and D-amino acid oxidase gene expression using short interfering nucleic acids.* PCT Int. Appl. (2003), WO 2003070743.
25. Usman, Nassim; McSwiggen, James A.; Zinnen, Shawn; Seiwert, Scott; Haerberli, Peter; Chowrira, Bharat; Blatt, Lawrence; Vaish, Narendra K. (USA). *Methods and kits containing nucleic acid-based enzymes for detection of single nucleotide polymorphisms in diagnosis of*

- diseases. U.S. Pat. Appl. Publ. (2003), US 2003065155.
26. Usman, Nassim; McSwiggen, James A.; Zinnen, Shawn; Seiwert, Scott; Haerberli, Peter; Chowrira, Bharat; Blatt, Lawrence; Vaish, Narendra. (USA). *Methods and kits containing nucleic acid-based enzymes for detection of single nucleotide polymorphisms in diagnosis of diseases.* U.S. Pat. Appl. Publ. (2003), US 2003008295.
27. Blatt, Lawrence; Chowrira, Bharat; Haerberli, Peter; McSwiggen, James; Fosnaugh, Kathy. (Ribozyme Pharmaceuticals, Incorporated, USA). *Modulation of gene expression associated with inflammation, proliferation and neurite outgrowth using antisense and enzymic nucleic acid-based technologies.* PCT Int. Appl. (2002), WO 2002081628.
28. Beigelman, Leonid; Karpeisky, Alexander; Serebryany, Vladimir; Haerberli, Peter; Sweedler, David. (USA). *Methods for synthesizing nucleosides, nucleoside derivatives and non-nucleoside phosphoramidites and succinates.* U.S. Pat. Appl. Publ. (2002), US 2002150936.
29. Thompson, James; Beigelman, Leonid; McSwiggen, James; Karpeisky, Alexander; Bellon, Laurent; Reynolds, Mark; Zwick, Michael; Jarvis, Thale; Woolf, Tod; Haerberli, Peter; Matulic-Adamic, Jasenka. (Sirna Therapeutics, Inc., USA). *Nucleic acid molecules with novel chemical compositions capable of modulating gene expression.* U.S. Pat. Appl. Publ. (2002), US 2002142980.
30. Beigelman, Leonid; Karpeisky, Alexander; Serebryany, Vladimir; Haerberli, Peter; Sweedler, David. (Ribozyme Pharmaceuticals, Incorporated, USA). *Methods for synthesizing nucleosides, nucleoside derivatives and non-nucleoside phosphoramidites and succinates.* PCT Int. Appl. (2002), WO 2002018405.
31. Usman, Nassim; McSwiggen, James A.; Zinnen, Shawn; Seiwert, Scott; Haerberli, Peter; Chowrira, Bharat; Blatt, Lawrence. (Ribozyme Pharmaceuticals, Inc., USA). *Ligand-modulated ribozymes for detection of analytes by reporter group addition.* PCT Int. Appl. (2001), WO 2001066721.
32. Thompson, James D.; Beigelman, Leonid; McSwiggen, James A.; Karpeisky, Alexander; Bellon, Laurent; Reynolds, Mark; Zwick, Michael; Jarvis, Thale; Woolf, Tod; Haerberli, Peter; Matulic-Adamic, Jasenka. (Ribozyme Pharmaceuticals, Inc., USA). *Chemically modified ribozymes, antisense- and triplex-forming oligonucleotides for modulation of gene expression and tumor inhibition.* PCT Int. Appl. (1999), WO 9954459.
33. Beigelman, Leonid; Sweedler, David; Haerberli, Peter; Karpeisky, Alexander. (Ribozyme Pharmaceuticals, Inc., USA). *Regioselective preparation of 2'-O-methoxy purine nucleosides via methylation.* U.S. (1999), US 5962675.
34. Beigelman, Leonid; Matulic-Adamic, Jasenka; Karpeisky, Alex; Haerberli, Peter; Sweedler, David; Reynolds, Mark; Chaudhary, Nilabh; Min, John. (Ribozyme Pharmaceuticals, Incorporated, USA). *Preparation of novel compositions for the delivery of negatively charged molecules.* PCT Int. Appl. (1999), WO 9905094.
35. Wincott, Francine; Usman, Nassim; Beigelman, Leonid; Haerberli, Peter; Matulic-Adamic, Jasenka; Karpeisky, Alexander; Sweedler, David; Jarvis, Thale; Drenzo, Anthony. (Ribozyme Pharmaceuticals, Inc., USA). *Synthesis of methoxy nucleosides and their incorporation into RNA ribozymes.* PCT Int. Appl. (1997), WO 9726270.